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## P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

**Seventh Semester, B.E. - Electrical and Electronics Engineering**

**Semester End Examination; Dec - 2017/Jan - 2018**

### Utilization of Electrical Power

Time: 3 hrs

Max. Marks: 100

**Note:** i) Answer **FIVE** full questions, selecting **ONE** full question from each unit.

ii) Any missing data can be suitably assumed.

#### UNIT - I

- 1 a. What are the different modes of transfer of heat? Explain them briefly. 6
- b. Explain the different methods of resistance heating with neat figure. 6
- c. In a 3 phase arc furnace to melt to 10 tonns of steel in 2 hours. Estimate the average input required to the furnace, if overall efficiency is 50%. If the current input in 9000 A, with the above kW input and the resistance and reactance of furnace leads including transformer are 0.003  $\Omega$  and 0.005  $\Omega$  respectively. 8
- Given that: Specific heat of steel = 444 J/kg/°C  
 Latent heat of the fusion of steel = 37.25 kJ/kg  
 Melting point of steel = 1370°C  
 Initial dimension of steel = 20°C.
- 2 a. What are the advantages of Electric heating? 6
- b. Explain the Ajax Wyatt Vertical core type induction furnace. 8
- c. Explain the process of Butt Welding with the help of a neat figure. 6

#### UNIT - II

- 3 a. Define and explain the laws of illumination. 6
- b. Explain the working of a Sodium vapour discharge lamp. 8
- c. An illumination on the working plane of 75 lux is required in the room of 72x15 mt<sup>2</sup> in size. The lamps are required to be swing 4 mt above the working bench. Assuming a suitable space height ratio, a utilization factor of 0.5, a lamp efficiency of 14 lumens/watt and candle power depreciation of 20%, estimate the number, rating and disposition of lamps. 6
- 4 a. What are the different lighting schemes? Explain them briefly. 6
- b. A building frontage 50 x 15 mt<sup>2</sup> is to be illuminated by flood lighting. Projectors situated 25 mt away. If the illumination is 100 lux, coefficient of utilization 0.5, depreciation factor 1.5, waste light factor 1.2. Estimate the size of the projectors and number of bulbs required. 8
- c. Explain the factory lighting schemes to take care of employees for production increase and for reducing accidents. 6

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**UNIT - III**

- 5 a. Explain the different systems of Electric traction. 10  
 b. What are the different systems of track electrification? Explain briefly. 10
- 6 a. What are the advantages of AC systems over DC system? 8  
 b. What are the requirements of an ideal traction system? 6  
 c. Write about an electrical transmission system in Electric traction motors? 6

**UNIT - IV**

- 7 a. Draw and explain the typical speed time curve of electric traction. 6  
 b. What are the factors affecting specific energy consumption of an electric train? 8  
 c. The distance between two stations is 1 km and the scheduled speed is 30 kmph, station stopping time 20 seconds. Assuming breaking retardation is 3 kmphs and maximum speed is 1.25 times the average speed. Determine the acceleration required to run the service, if the speed-time curve is approximated by a trapezoidal curve. 6
- 8 a. Derive the expression for total tractive effort required to run the train on track. 10  
 b. A electric train has quadrilateral speed time curve as follows :  
 (i) Uniform acceleration from rest at 2 kmphs for 30 seconds  
 (ii) Coasting for 50 seconds  
 (iii) Braking period of 20 seconds. 10
- The train is moving in a uniform down gradient of 1%, traction resistance of 40 N/tonne, rotational inertia effect 10% of dead weight, duration of stop 15 seconds, and overall efficiency of transmission gear and motor is 75%. Calculate the scheduled speed and specific energy consumption of run.

**UNIT - V**

- 9 a. Explain the expected electrical characteristics for traction motors. 6  
 b. Explain the characteristics of an AC series motor. 6  
 c. Explain the regeneration braking applied to an AC series motor. 8
- 10 a. Explain the operating characteristics of DC series motor. 6  
 b. Explain the principle of operation of a linear Induction motor. 8  
 c. Explain the speed control of a series motor using series-parallel and resistance control. 6

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